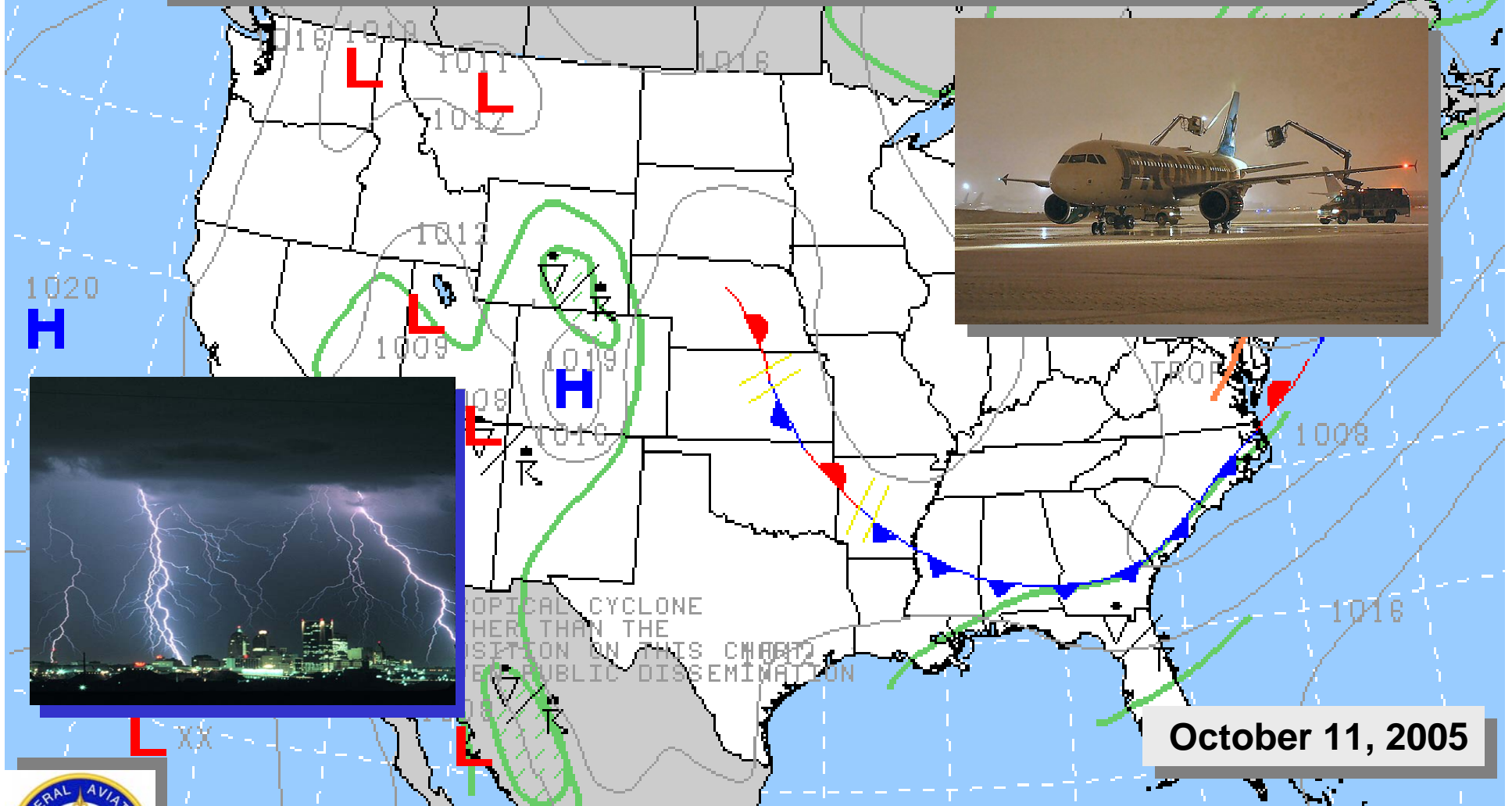


# Weather Classification

OEP 35 Airports and Chicago O'Hare Intl. Airport (ORD)  
Presentation to Customer Satisfaction Metrics Work Group



Federal Aviation Administration  
Office of Aviation Policy and Plans

File: apo130\customer satisfaction\weather.ppt

# Purpose

☛ To classify weather on an hourly basis by airport as having

- ☛ None
- ☛ Minor
- ☛ Moderate
- ☛ Severe impact on airline scheduled flights.

## How Would the Classification Be Used?

- ☛ Compare one time period to another in terms of percent of operations in each weather category.
- ☛ Use as an explanatory measure for changes in delay metrics.
- ☛ Be able to assess FAA procedural or technical improvements in handling flights in 'bad weather'.

# Underlying Principles

- ✿ Data must be readily available.
- ✿ Methodology needs to be simple and easily explained.
- ✿ Percentage of operations in each weather category must pass the reasonableness test for each airport and also for each month.
- ✿ Appropriate delay measures
  - ✿ Percent on-time departures
  - ✿ Percent on-time arrivals
  - ✿ Average delay for all departures
  - ✿ Average delay for all arrivals

move in the right direction as the weather classification moves from none to severe.

# Impacting Conditions Analyzed

- ☁ Wind.
- ☁ Ceiling.
- ☁ Visibility.
- ☁ OPSNET recorded weather delays.
- ☁ Severity of local weather conditions.
- ☁ Thunderstorms reported at nearby weather stations (50 miles).
- ☁ Airport arrival and departure rates (AAR and ADR).
- ☁ Enroute thunderstorms

**Note:**

- A weight value is applied to each impacting condition (0: not significant, 1: significant, 2: very significant, 3: extremely significant).

**ASPM**  
MANAGEMENT  
REPORTS

FLASH REPORTS

AIRPORT  
COMMENTS

KEY DELAY  
INDICATORS

AIRPORT  
EFFICIENCY

AAR/ ADR  
CALCULATOR

ANALYSIS

CAUSALITY

WEATHER  
FACTORS

ENROUTE

TAXI TIMES

INDIVIDUAL  
FLIGHTS

CANCELLED  
FLIGHTS

DOWNLOAD

DATA REFERENCE  
GUIDE

INFORMATION

FAA HOME

APO HOME

CONTACT US

Scenario Public Edit Delete

<a href="#">Default</a>	Y		
<a href="#">lga1</a>	N		
<a href="#">DFW1</a>	N		

[Create New](#)

[Return To Reports](#)

Scenario Default

Facilities	Factors
ORD	Please Select

Facility : ORD

Scenario Variables

Factor Name	None		Minor		Moderate		Severe		Factor Weight	Mark Severe
	Min	Max	Min	Max	Min	Max	Min	Max		
Wind Speed in Knots :	0	10	11	14	15	21	22	999	2	<input type="checkbox"/>
Ceiling in Hundreds of Feet :	999	18	17	11	10	6	5	0	2	<input type="checkbox"/>
Visibility in Statute Miles :	999.99	8	7.99	4	3.99	1.01	1	0	2	<input type="checkbox"/>
Number of Hourly OPSNET Weather Delays :	0	8	9	20	21	34	35	999	2	
Severity of Local Weather Conditions :	0	0	1	1	2	2	3	3	2	
Thunderstorms Within 50 Miles :	0	0	0	0	0	0	1	999	1	
Hourly Airport Rates (AAR + ADR) :	999	192	191	179	178	170	169	0	2	
ASPM Enroute Excess Miles :	0	11.99	12	14.99	15	17.99	18	999.99	0	
ASPM Enroute Excess Time Flown :	0	6.99	7	7.99	8	9.99	10	999.99	0	
Enroute Thunderstorms :	0	0	1	1	2	2	3	999	1	
Overall Impacting Conditions :	0	0.29	0.3	0.43	0.44	1.5	1.51	999.9	1	

Save Scenario Variables

## Comments on Scenario Interface

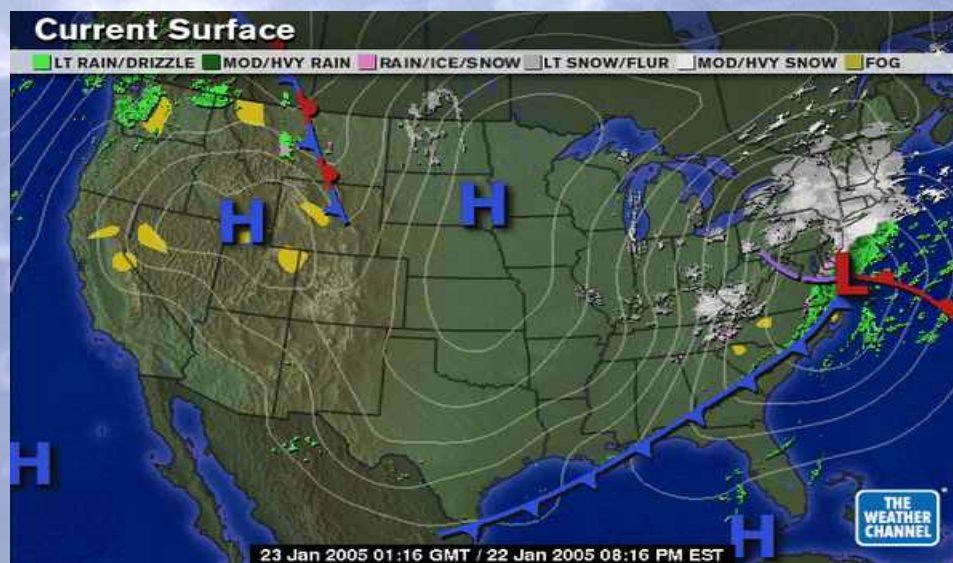
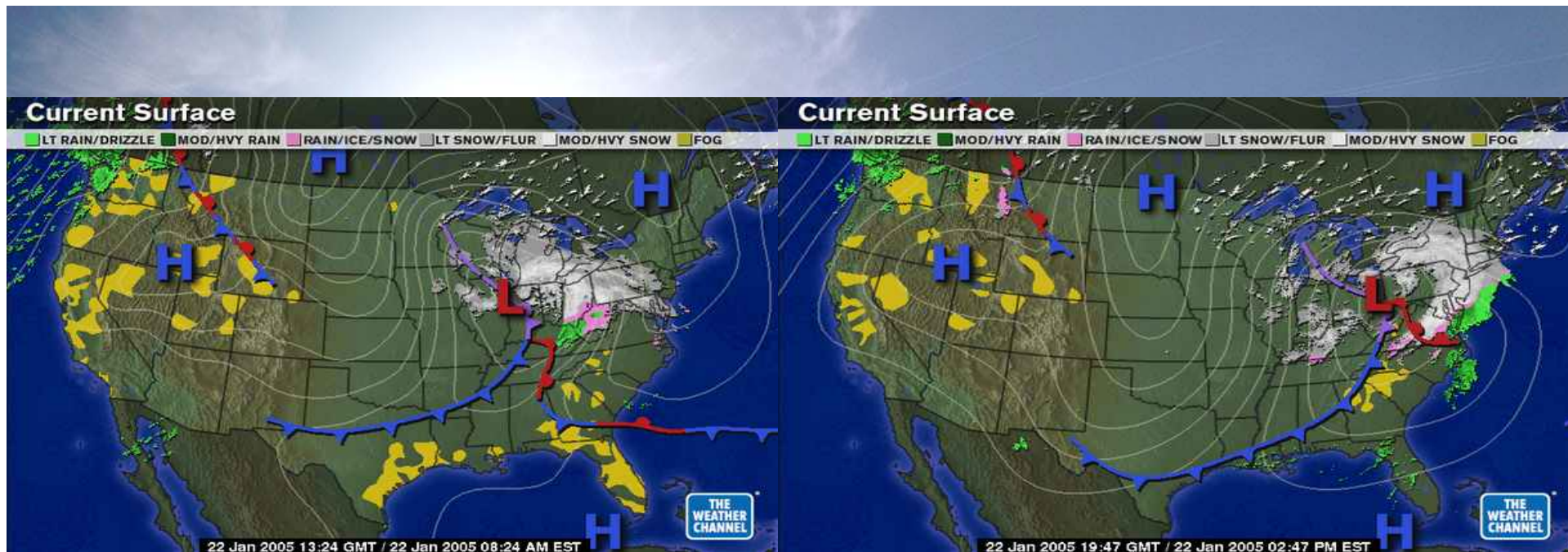
- ✦ The interface allows users to create and save scenarios by changing the key weather parameters.
- ✦ Each factor can be assigned a weight from 0 to 3 depending on the impact.
- ✦ For each impacting condition, the ranges were determined by examining the distribution and the impact on the percent on-time arrivals from January 2000 through December 2004.
- ✦ Wind speed, ceiling and visibility are the three factors that if severe than an hour can be marked as severe regardless of the overall condition.
- ✦ For ORD, wind is characterized as 'none' (0) if the speed is between 0 and 10 knots, 'minor' (1) from 11 to 14, 'moderate' (2) from 15 to 21 and 'severe' (3) greater than 22 knots.
- ✦ The overall score is the weighted average of the eight weather factors (wind, ceiling, visibility, OPSNET weather delays, local weather, nearby thunderstorms, AAR, enroute thunderstorms).
- ✦ Local weather, nearby thunderstorms, enroute thunderstorms are extracted from the data at the applicable weather stations.



## Weather Factors Frequency Report - Scenario : Default

From 10/2000 To 01/2005 : 'ORD'

Wind Speed (Knots) For ORD	Impact	Time Periods	% Of Time Periods	Cumulative % Of Time Periods	Total Scheduled Operations	% Of Total Scheduled Operations	Cumulative % Of Total Scheduled Operations	% Of On-Time Arrivals	Cumulative % Of On-Time Arrivals
0	None	2629	6.92	6.92	156497	3.9	3.9	80.11	80.11
1	None	3	0.01	6.92	393	0.01	3.9	58.72	80.06
3	None	1986	5.22	12.15	139500	3.47	7.38	79.72	79.9
4	None	2679	7.05	19.19	215407	5.36	12.74	78.39	79.27
5	None	3269	8.6	27.79	300971	7.49	20.23	78.28	78.9
6	None	3481	9.16	36.95	351806	8.76	28.99	77.21	78.39
7	None	3629	9.55	46.5	388259	9.66	38.65	77.89	78.27
8	None	3576	9.41	55.9	406970	10.13	48.78	77.51	78.11
9	None	3243	8.53	64.43	384898	9.58	58.36	77.04	77.94
10	None	3044	8.01	72.44	366844	9.13	67.49	75.42	77.59
11	Minor	2512	6.61	79.05	305195	7.6	75.09	74.13	77.25
12	Minor	2138	5.62	84.67	263448	6.56	81.64	74.22	77
13	Minor	1575	4.14	88.82	197508	4.92	86.56	73	76.78
14	Minor	1225	3.22	92.04	155018	3.86	90.42	70.88	76.53
15	Moderate	882	2.32	94.36	110573	2.75	93.17	70.03	76.34
16	Moderate	670	1.76	96.12	83651	2.08	95.25	69.14	76.18
17	Moderate	469	1.23	97.35	59739	1.49	96.74	67.91	76.06
18	Moderate	332	0.87	98.23	41957	1.04	97.78	64.55	75.94
19	Moderate	220	0.58	98.81	27661	0.69	98.47	62.04	75.85
20	Moderate	142	0.37	99.18	18136	0.45	98.92	63.15	75.79
21	Moderate	91	0.24	99.42	11732	0.29	99.22	60.08	75.75
22	Severe	69	0.18	99.6	9425	0.23	99.45	56.31	75.7
23	Severe	53	0.14	99.74	7728	0.19	99.64	46.81	75.65
24	Severe	23	0.06	99.8	3826	0.1	99.74	55.73	75.63
25	Severe	31	0.08	99.88	4307	0.11	99.84	39.62	75.6
26	Severe	15	0.04	99.92	1977	0.05	99.89	41.85	75.58
27	Severe	12	0.03	99.95	1641	0.04	99.93	18.55	75.56
28	Severe	4	0.01	99.96	562	0.01	99.95	22.22	75.55
29	Severe	4	0.01	99.97	636	0.02	99.96	21.57	75.55
30	Severe	2	0.01	99.98	9	0	99.96	0	75.55
31	Severe	1	0	99.98	209	0.01	99.97	20.2	75.54
32	Severe	1	0	99.98	170	0	99.97	4.35	75.54
33	Severe	1	0	99.99	152	0	99.98	60.71	75.54
34	Severe	4	0.01	100	693	0.02	100	81.17	75.54
36	Severe	1	0	100	199	0	100	20.83	75.54
<b>Total</b>		<b>38016</b>	<b>100</b>	<b>100</b>	<b>4017697</b>	<b>100</b>	<b>100</b>	<b>75.54</b>	<b>75.54</b>





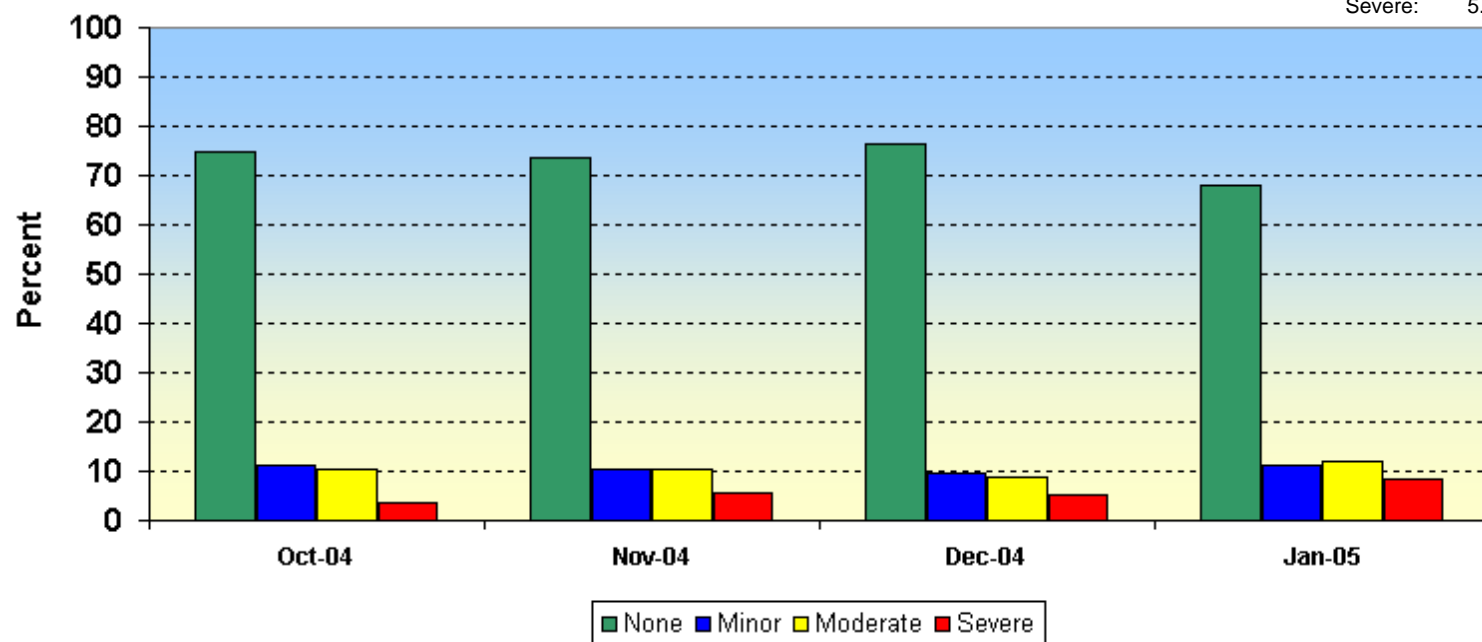
## Weather Factors Details Report - Scenario : Default

From 1/22/2005 To 1/22/2005 : 'ORD'

		Local Hour	Wind Speed (Knots)		Ceiling N x 100 (Feet)		Visibility (S.Miles)		OPSNET Weather Delays		Airport Weather		Near By TS		Airport Rates		Enroute Excess Miles		Enroute Excess Time Flown		Enroute TS			
Locid	Date	Wt=2		Wt=2		Wt=2		Wt=2		Wt=2		Wt=1		Wt=2		Wt=0		Wt=0		Wt=1				
		Val	Impact	Val	Impact	Val	Impact	Val	Impact	Val	Impact	Val	Impact	Val	Impact	Val	Impact	Val	Impact	Val	Impact	Val	Impact	
ORD	01/22/2005	0	9	None	999	None	0.5		1	None	SN FZFG		0	None	128		13.07	Minor	19.58		0	None	1.29	Moderate
ORD	01/22/2005	1	13	Minor	999	None	0.5		0	None	SN FZFG		0	None	128		2.65	None	6.74	None	0	None	1.43	Moderate
ORD	01/22/2005	2	10	None	999	None	0.75		0	None	-SN BR		0	None	128		0	None	0	None	0	None	1.29	Moderate
ORD	01/22/2005	3	8	None	15	Minor	1		0	None	-SN BR		0	None	128		0	None	0	None	0	None	1.43	Moderate
ORD	01/22/2005	4	3	None	9	Moderate	0.75		0	None	-SN BR		0	None	128		3.92	None	15.26		0	None	1.57	
ORD	01/22/2005	5	3	None	9	Moderate	0.75		0	None	-SN BR		0	None	128		9.01	None	17.54		0	None	1.57	
ORD	01/22/2005	6	6	None	70	None	2.5	Moderate	0	None	-SN		0	None	120		4.07	None	10.03		0	None	1.14	Moderate
ORD	01/22/2005	7	8	None	75	None	3	Moderate	1	None	-SN		0	None	112		4.88	None	5.65	None	0	None	1.14	Moderate
ORD	01/22/2005	8	10	None	27	None	2	Moderate	9	Minor	-SN		0	None	112		8.74	None	6.41	None	0	None	1.29	Moderate
ORD	01/22/2005	9	11	Minor	10	Moderate	0.75		14	Minor	-SN		0	None	112		7.05	None	6.37	None	0	None	1.86	
ORD	01/22/2005	10	18	Moderate	9	Moderate	0.5		17	Minor	SN BLSN		0	None	112		7.54	None	7.4	Minor	0	None	2	
ORD	01/22/2005	11	17	Moderate	7	Moderate	0.25		23	Moderate	+SN BLSN		0	None	102		7.16	None	6.95	None	0	None	2.14	
ORD	01/22/2005	12	21	Moderate	7	Moderate	0.25		29	Moderate	+SN BLSN		0	None	100		7.78	None	12.99		0	None	2.14	
ORD	01/22/2005	13	18	Moderate	20	None	0.5		28	Moderate	SN BLSN		0	None	100		9.02	None	9.95	Moderate	0	None	1.86	
ORD	01/22/2005	14	16	Moderate	19	None	0.5		32	Moderate	-SN BLSN		0	None	72		7.89	None	19.07		0	None	1.86	
ORD	01/22/2005	15	21	Moderate	15	Minor	1.5	Moderate	36		-SN BLSN		0	None	60		8.65	None	25.7		0	None	2	
ORD	01/22/2005	16	21	Moderate	15	Minor	1.5	Moderate	17	Minor	-SN BLSN		0	None	80		7.8	None	19.01		0	None	1.71	
ORD	01/22/2005	17	18	Moderate	999	None	3	Moderate	23	Moderate	BLSN		0	None	80		4.18	None	10.43		0	None	1.71	
ORD	01/22/2005	18	20	Moderate	999	None	4	Minor	27	Moderate	BLSN		0	None	80		4.67	None	9.48	Moderate	0	None	1.57	
ORD	01/22/2005	19	22		999	None	4	Minor	14	Minor	BLSN		0	None	100		6.6	None	7.96	Minor	0	None	1.57	
ORD	01/22/2005	20	17	Moderate	999	None	5	Minor	10	Minor	BLSN		0	None	100		8.16	None	10.76		0	None	1.43	Moderate
ORD	01/22/2005	21	19	Moderate	999	None	5	Minor	20	Minor	BLSN		0	None	100		11.76	None	14.1		0	None	1.43	Moderate
ORD	01/22/2005	22	17	Moderate	999	None	7	Minor	7	None	-	None	0	None	100		10.46	None	28.33		0	None	0.86	Moderate
ORD	01/22/2005	23	17	Moderate	999	None	6	Minor	13	Minor	HZ	Minor	0	None	100		11.79	None	16.75		0	None	1.14	Moderate

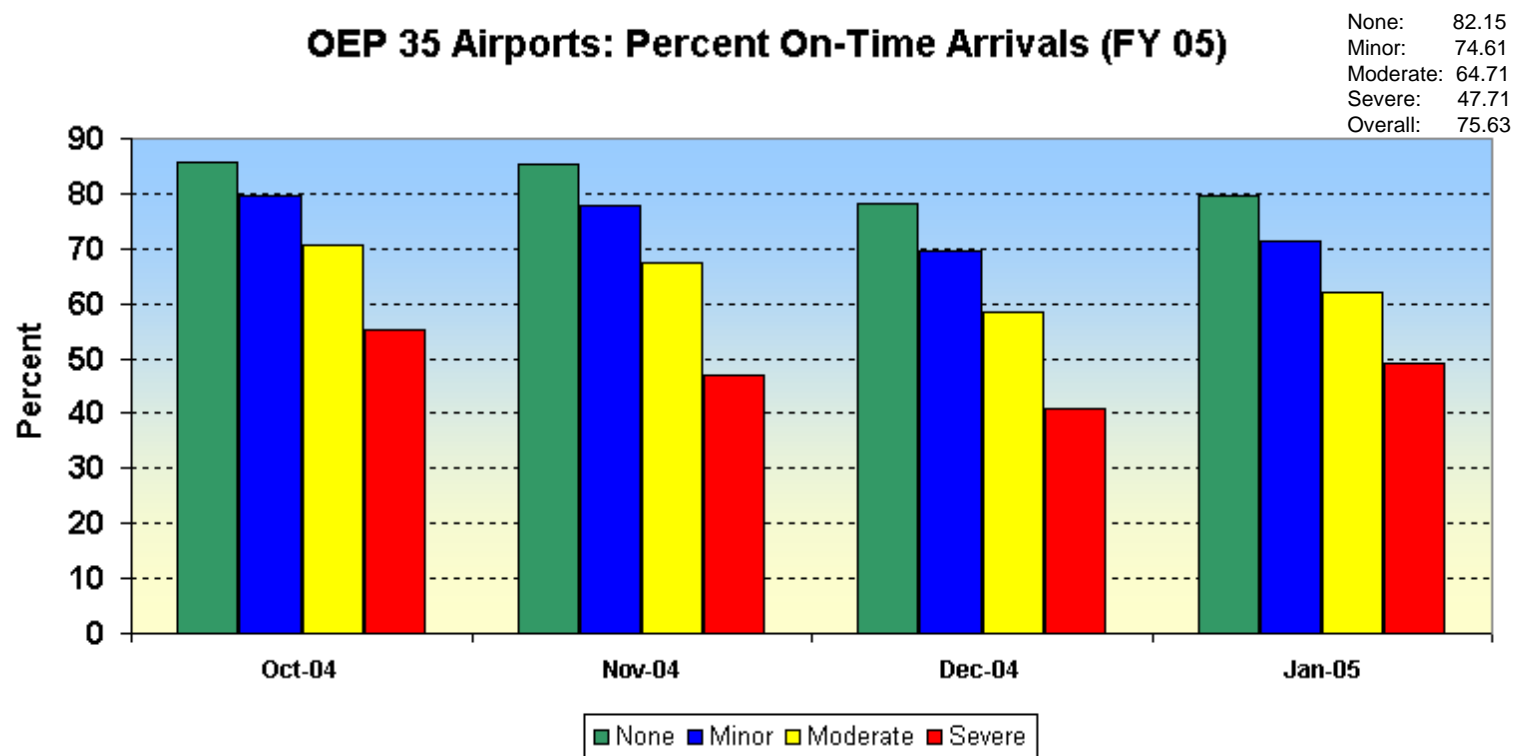
### OEP 35: Percent Scheduled Operations (FY 05)

None: 73.25  
Minor: 10.63  
Moderate: 10.37  
Severe: 5.75



Source: ASPM

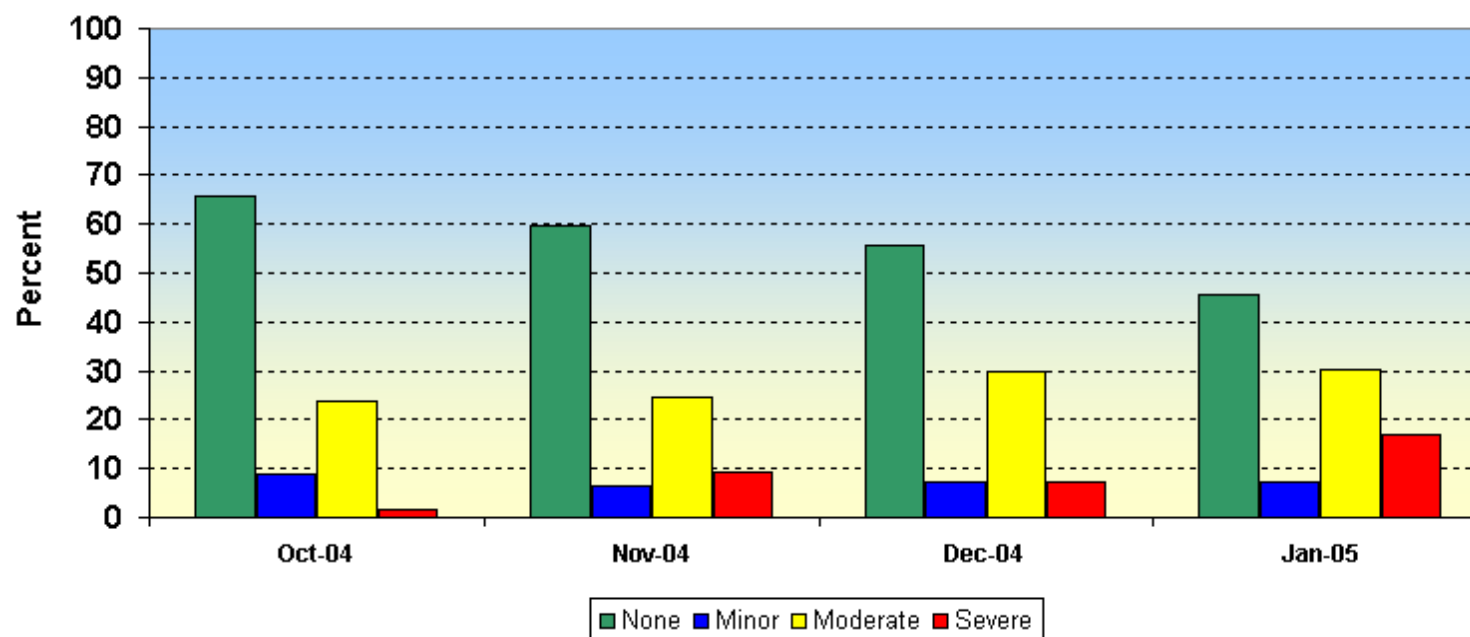
### OEP 35 Airports: Percent On-Time Arrivals (FY 05)



Source: ASPM

### ORD: Percent Scheduled Operations (FY 05)

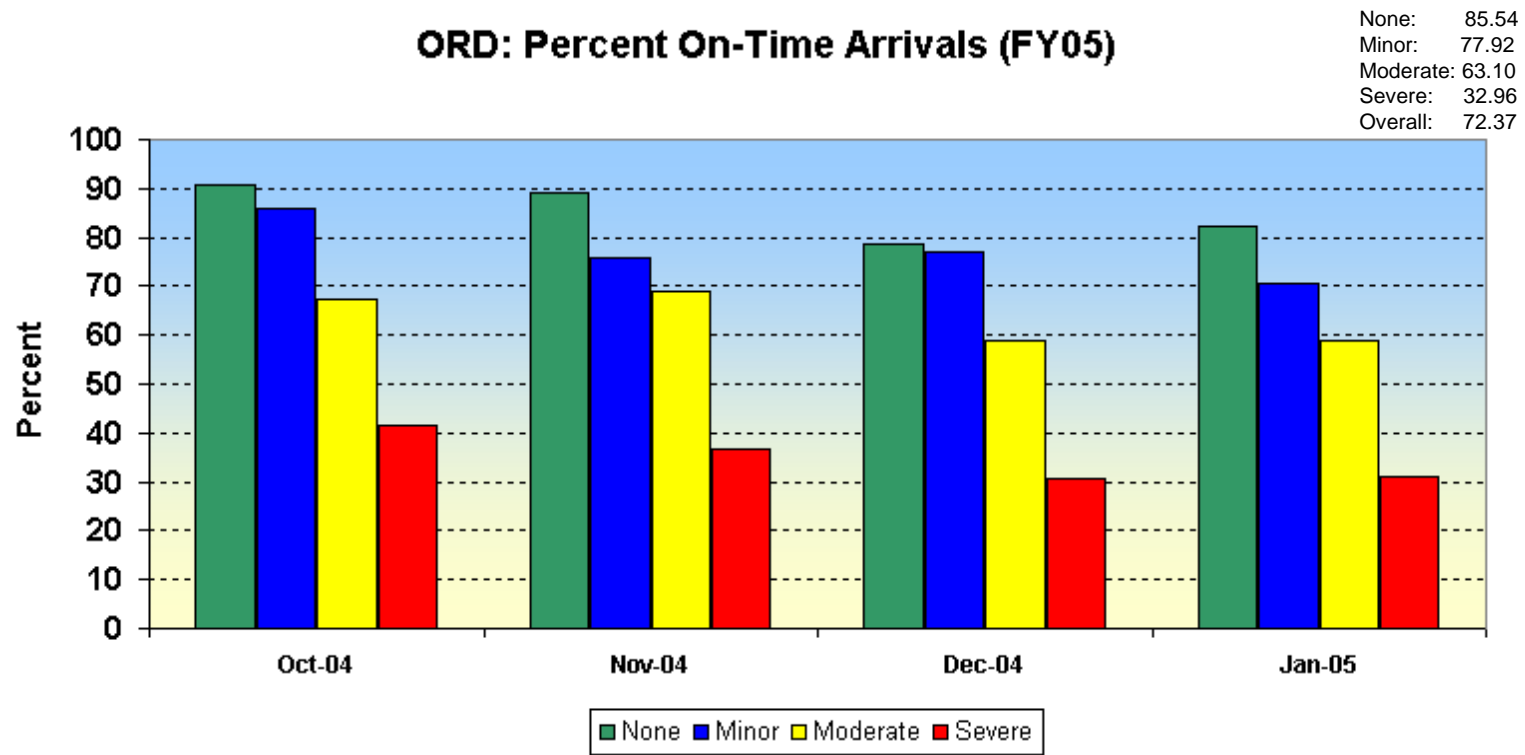
None: 56.80  
Minor: 7.45  
Moderate: 27.07  
Severe: 8.68



Source: ASPM



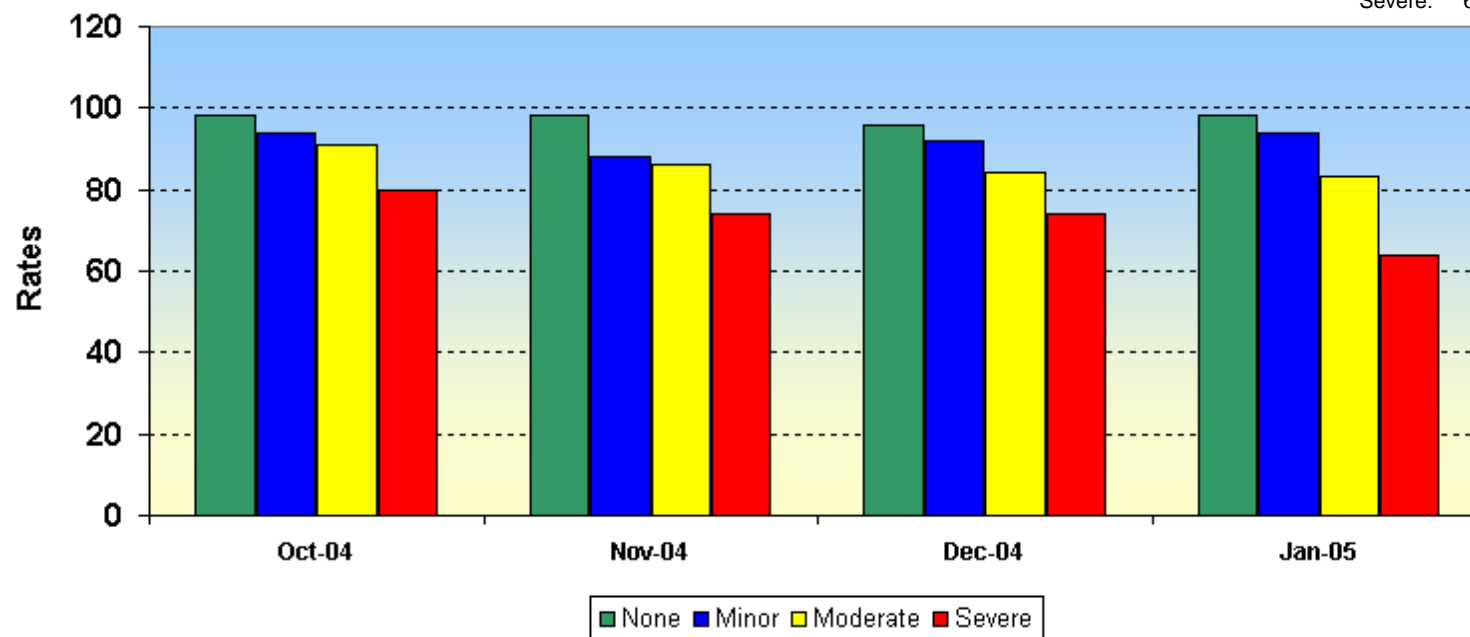
### ORD: Percent On-Time Arrivals (FY05)



Source: ASPM

### ORD: Airport Arrival Rates (AAR) in FY 05

None: 97  
Minor: 92  
Moderate: 85  
Severe: 69



Source: ASPM

## Validation for Percent On-Time Arrivals (Flight Plan)

☂ Six tests each period

☂ Percent on-time in none should be greater than percent on-time in minor, moderate, or severe (3 tests).

☂ Percent on-time in minor should be greater than percent on-time in moderate and severe (2 tests).

☂ Percent on-time in moderate should be greater than percent on-time in severe (1 test).

Fiscal Year	Tests	% OEP 35 Correct Tests	% ORD Correct Tests
2001	72	100	98
2002	72	100	100
2003	72	100	100
2004	72	100	98
2005	24	100	100

## Weather Severity Methodology Used in ASPM

Airport hourly weather severity value is derived from the ASOS weather type or the ASOS weather attribute that is reported at the local ASOS weather stations. The type and attribute are assigned a severity code according to the table below that range between 1, 2 or 3 with the highest severity code observed per hour being used to represent the airport hourly severity rating for all the flights in that hour. The type and attribute are from the ASOS data field "Weather Type" that are recorded twice an hour in record type "AA" (Hourly METAR Report) or record type "SP" (METAR Special Report).

Airport Weather Severity Description			
Match Order	Code	Description	Severity
1	TS	Thunderstorm	3
2	FZ	Freezing	3
3	GR	Hail	3
4	GS	Snow Pellets	3
5	SN	Snow	3
6	SG	Snow Grains	3
7	FC	Funnel Cloud	3
8	FG	Fog	3
9	IC	Ice Crystals	3
10	PL	Ice Pellets	3
11	DS	Duststorm	3
12	+	Heavy	3
13	PO	Dust Whirls	3
14	SS	Sandstorm	3
15	BR	Mist	2
16	FU	Smoke	2

Airport Weather Severity Description			
Match Order	Code	Description	Severity
17	SA	Sand	2
18	RA	Rain	2
19	BL	Blowing	2
20	DU	Widespread Dust	1
21	DZ	Drizzle	1
22	UP	Unknown Precipitation	1
23	HZ	Haze	1
24	VA	Volcanic	1
25	SH	Showers	1
26	PY	Spray	1
27	SQ	Squall	1
28	DR	Low Drifting Snow	1
29	MI	Shallow Fog	1
30	PR	Partial	1
31	BC	Patches	1
32	VC	Vicinity	1





**Federal Aviation Administration**